X-34 Technology Testbed Flights

What are they?

- The primary focus is on two suborbital technology demonstration flights that are part of the X-34 development program
  - Flight profiles will be taylored to generate relevant environments for testing promising reusable launch technologies
  - Because the upper stage won't be on board, significant capability should be available to accomodate desired experiments
  - Test hardware development is not funded as part of the X-34 program
    - Limited funding for integration onto the X-34 vehicle is included
- "Piggyback" technology tests on the orbital demonstration flight will also be considered, as well as other possible follow-on testbed missions

When are they?

- Technology demonstration flights - December 1998 & June 1999
- Orbital demonstration flight - September 1998
- Early identification of technologies is desirable to minimize integration impacts
- Additional suborbital flights may be bought at $2-3M / flt

NASA Point of Contact

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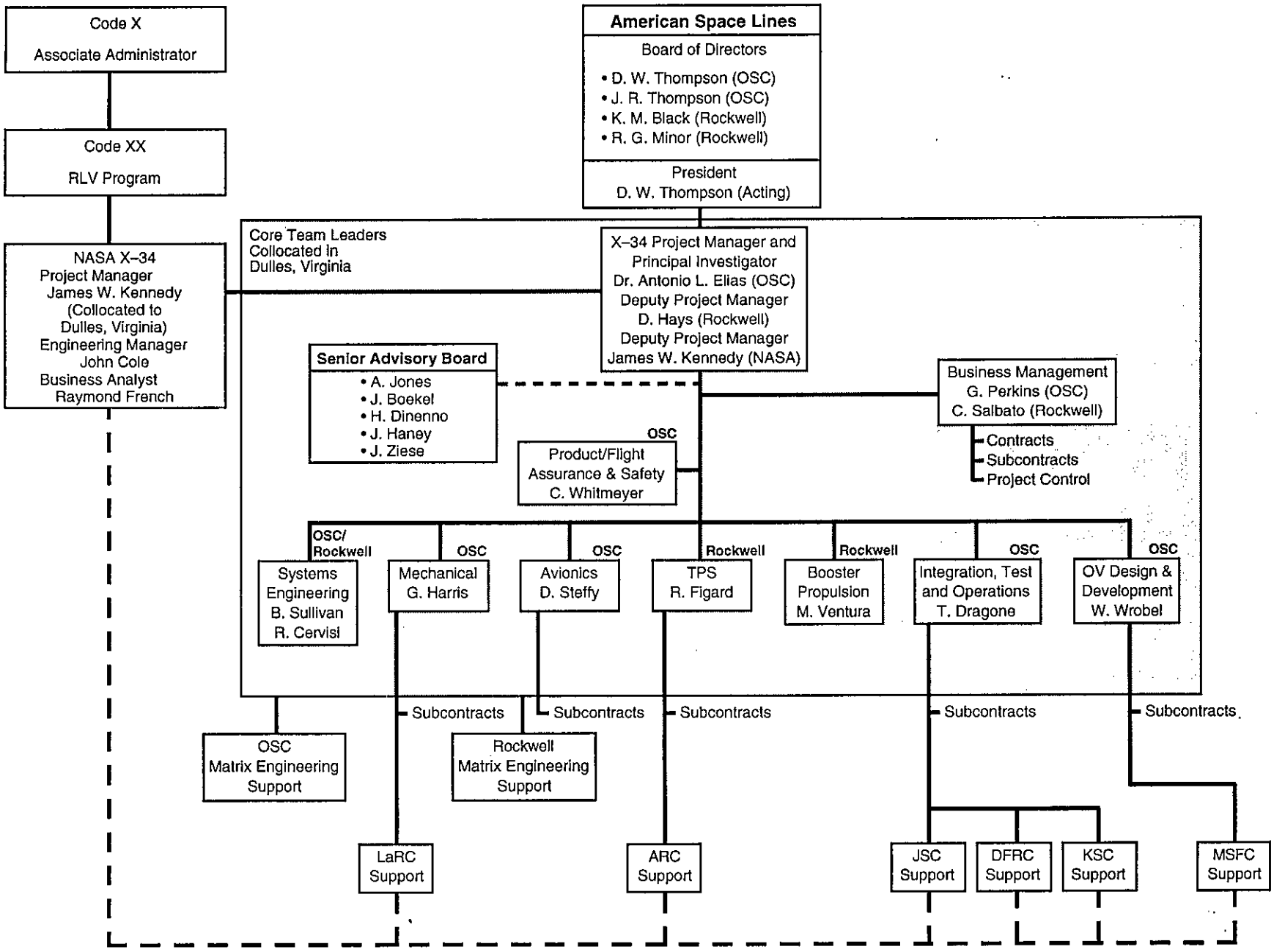
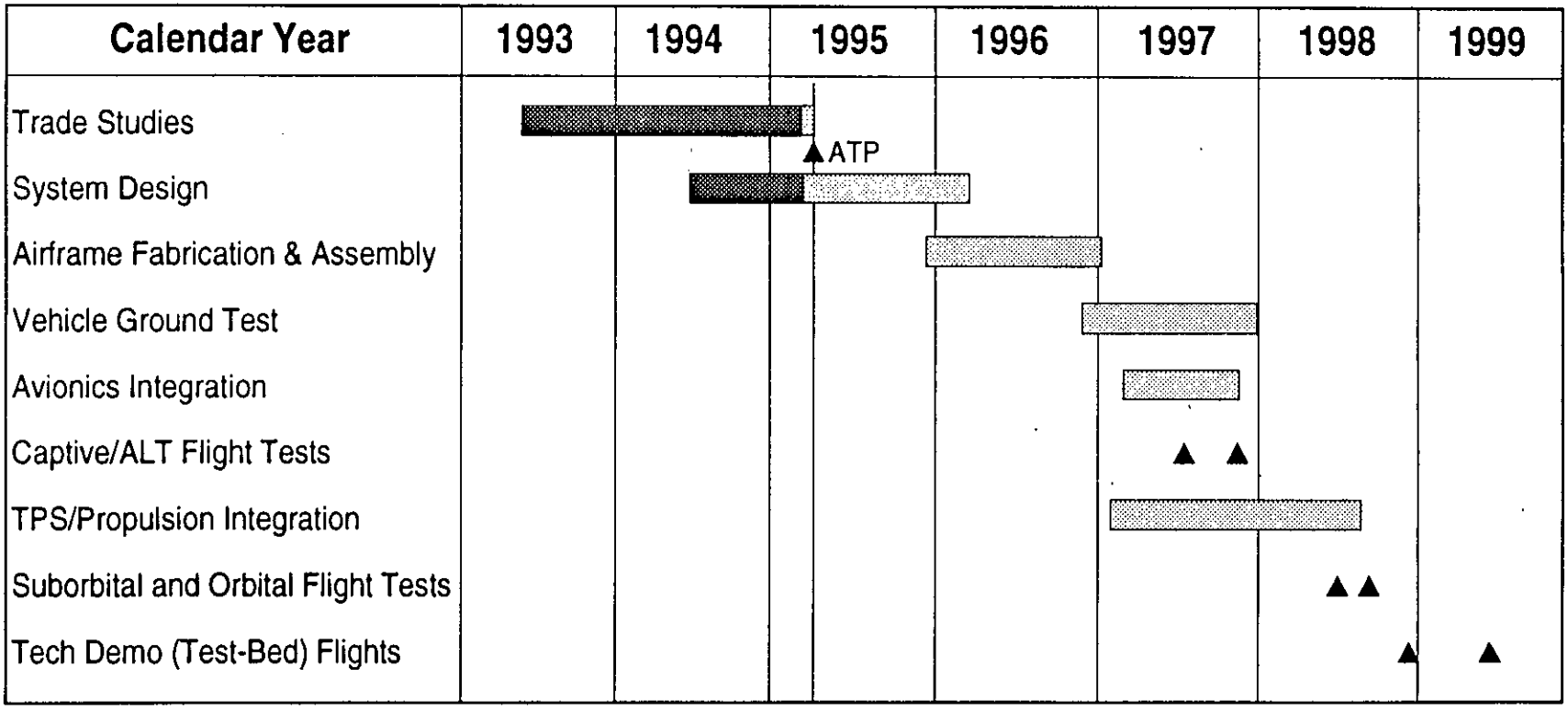
X–34
Proposed Management Structure and Organizational Interfaces



Our X-34 Program Schedule Reflects an 18 Month Advance Start

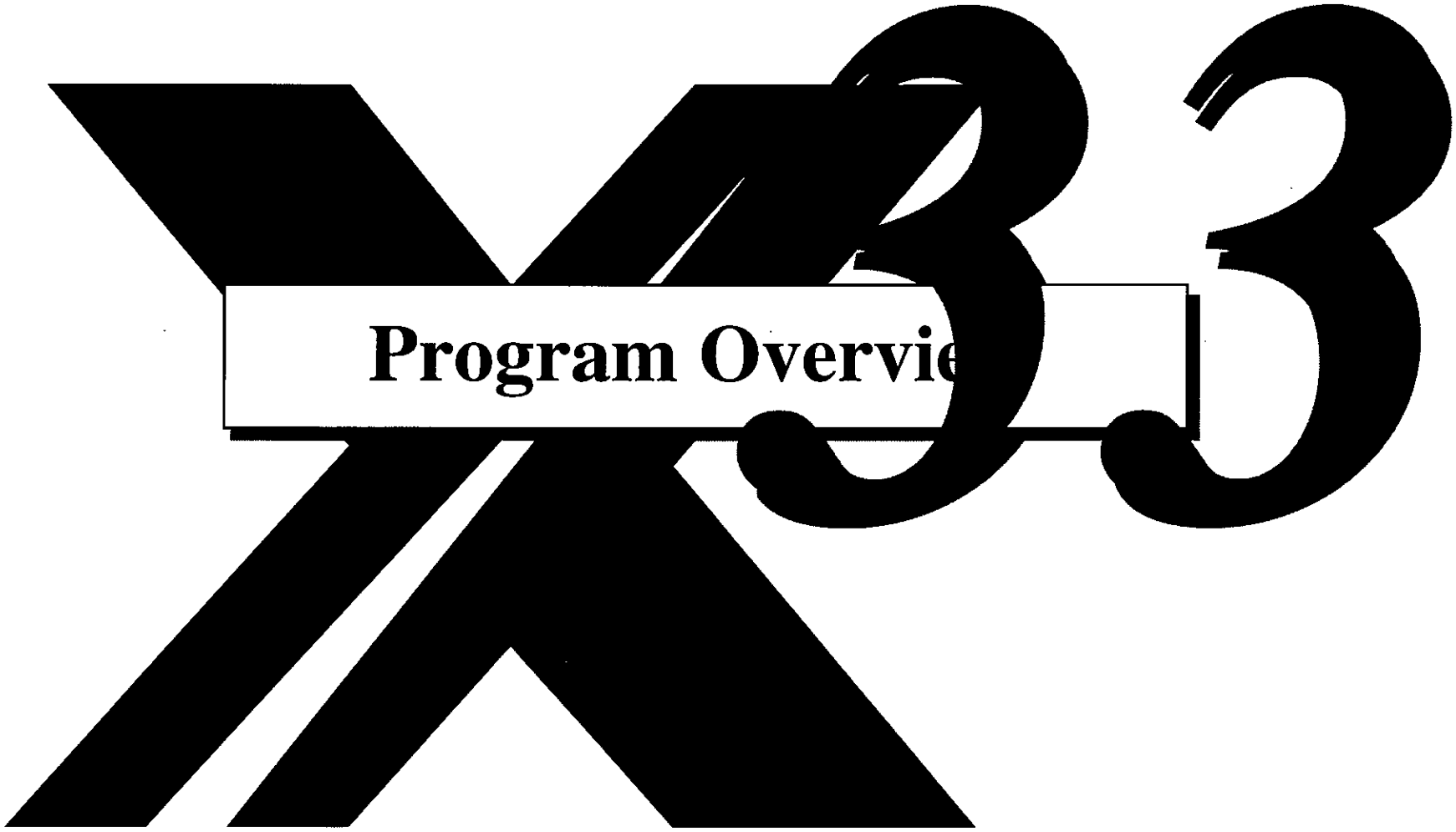
Orbital Sciences Corporation



X-34 RLV Decision Criteria

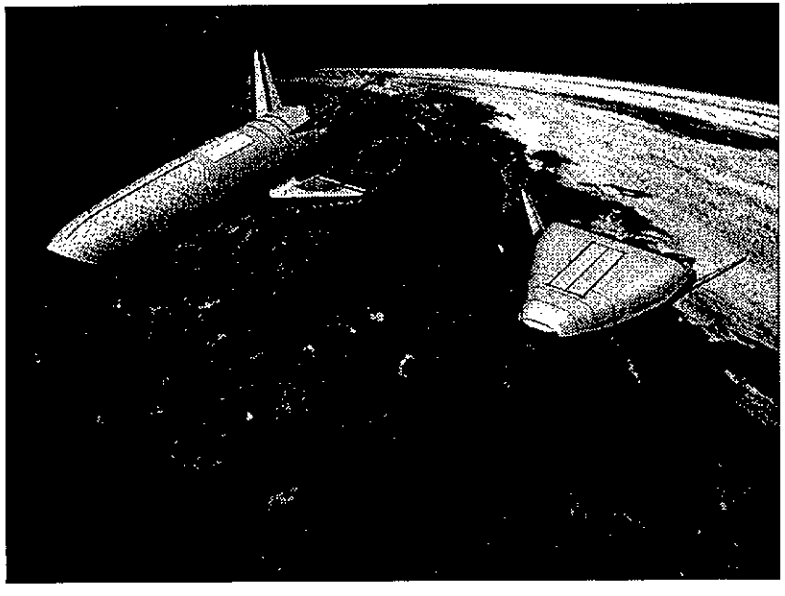
Orbital Sciences Corporation OSC Rockwell NASA

- 1996 Decision
  - NASA Project Management Office $\leq$ 20 People
  - Using "Traditional" Cost Estimating Techniques, Project "Should Cost" of X-34
    - Negotiated Value Should be 25%-50% Below this Value
  - Demonstrate an Industry Cost Share $\geq$ 50%
  - Achieve Development Goals on Schedule and with Fixed Government Budget
  - Complete Design Freeze
- 1999 Decision
  - Verify Cost Targets Above With Actuals
  - Reduce Launch Cost by a Factor of 3
  - Demonstrate as a Part of the Basic Booster Design (Embedded Tech)
    - Reusable Composite or Metallic Tanks
    - Reusable and Operable Engines
    - Reusable and Durable TPS Materials
    - Operations Concepts
  - Initiate Flight Test by March 1, 1998
  - Demonstrate Orbital Delivery by December, 1998
  - Provide Flight Data to Validate Vehicle Hypersonics (Ascent and Re-entry)
  - Demonstrate Thru Innovative Partnership With Industry, a Successful Development Program Within 3 Years and witn a Fixed Government Funding Profile



Gene Austin
May 24, 1995

X-33 Program



X-33 Program Goals and Objectives

Move immediately to mature the technologies essential for a decision on a next-generation reusable launch system capable of reliably serving the U.S. Government's and the commercial space transportation needs at substantially reduced costs.

The primary objectives of the X-33 program are to:

- mature the technologies required for the next-generation system
- demonstrate the capability to achieve low development and operational cost, and rapid launch turnaround times
- reduce technical risk to encourage private investment in the commercial development and operation of the next-generation system.

Implementation Strategy

- The X-33 program is an integrated, fast-track approach for reducing the technical and business risk in developing economical, operational, reusable launch vehicles.

- An integrated ground and flight test program that characterizes key component technologies and to validate their systems' capabilities, both from a performance and operations viewpoint.

  - The ground test program entails cycling of the candidate components under realistic environmental conditions to establish the acceptable number of flight cycles before deterioration, or failure of the components.

  - The flight test demonstration program will be implemented to identify component and system integration

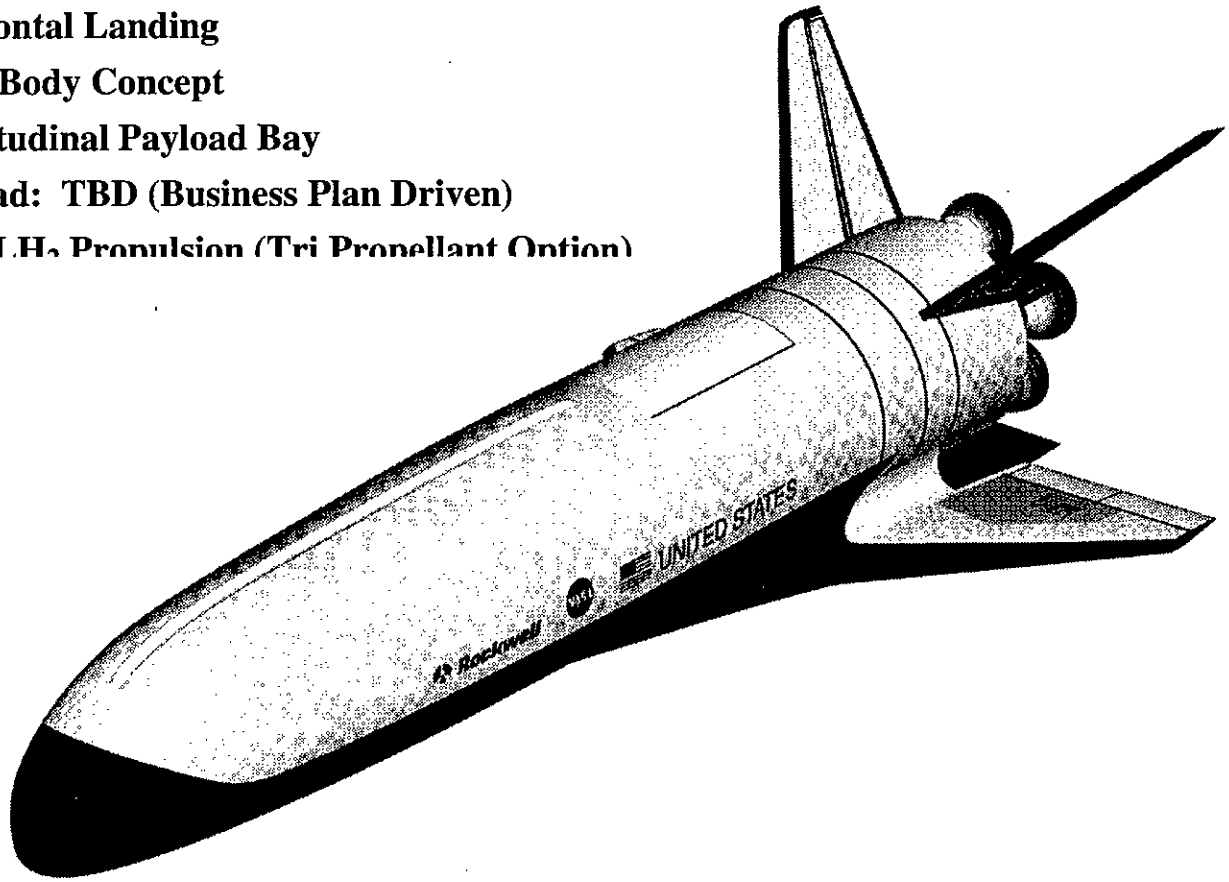
X-33 Attributes

- X-33 Is Not an Operational RLV System, But a Proof-of-Concept Demo
- X-33 Is Not A Shuttle II
- X-33 Is Not A Shuttle Basher
- X-33 Will Prove Concept of Single–Stage–To–Orbit Rocket
- X-33 Will Demonstrate Key Technologies in Flight
- X-33 Will Demonstrate "Airline Style" Operations
- X-33 Will Be a Fast Track Developed Vehicle
- X-33 Will Permit Acceptable Risk For Private Sector Investment In RLV
- **X-33 Is Industry Led**

X-33

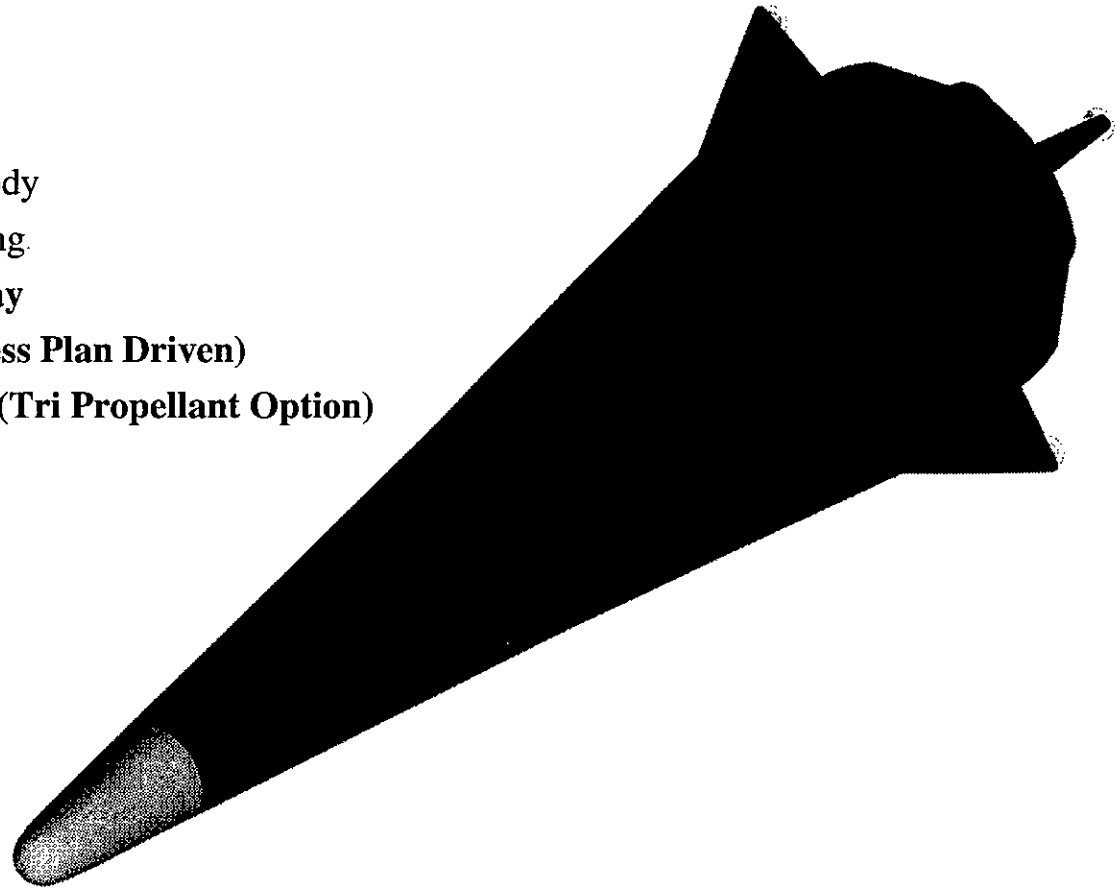
Rockwell - RLV Concept

- **Reference Concept**
  - Vertical Take-Off
  - Horizontal Landing
  - Wing Body Concept
  - Longitudinal Payload Bay
  - Payload: TBD (Business Plan Driven)
  - LOX/LH_2 Propulsion (Tri Propellant Option)



X-33 McDonnell Douglas/Boeing - RLV Concept

- **Reference Concept**
  - **- Vertical Take-Off**
  - **+ Vertical Landing**
    - ◆ Conic Reentry Body
    - ◆ Propulsive Landing
  - **- Transverse Payload Bay**
  - **- Payload: TBD (Business Plan Driven)**
  - **- LOX/LH_2 Propulsion (Tri Propellant Option)**



X-33 Lockheed Martin Skunk Works - RLV Concept

- **Reference Concept**
  - **Vertical Take-Off**
  - **Horizontal Landing**
  - **Lifting Body Concept**
  - **Longitudinal Payload Bay**
  - **Payload: TBD (Business Plan Driven)**
  - **+ LOX/LH_2 Propulsion**